

2018

CBCS

3rd Semester

CHEMISTRY

PAPER—C6T

(Honours)

Full Marks : 40

Time : 2 Hours

The figures in the right-hand margin indicate full marks.

Candidates are required to give their answers in their own words as far as practicable.

Illustrate the answers wherever necessary.

Inorganic Chemistry—II

Answer any *five* questions :

2×5

1. (a) Arrange the following components with increasing order of dipole moment. NF_3 , NH_3 , NCl_3 . Explain the order.
(b) Calculate the bond orders of CN^- and O_2^- .

(Turn Over)

- (c) Among NaCl and CuCl, which has higher melting point—and why ?
- (d) Write down the limitations of radius-ratio rule with example.
- (e) How age of rocks can be determined ?
- (f) CD_4 has slight lower boiling point than CH_4 —Explain.
- (g) Why $HgCl_2$ is colourless but HgI_2 is deep red in colour ?
- (h) What is the probable energy source of sun ?

2. Answer any four questions :

4×5

- (a) (i) How mass defect is related to binding energy ?
- (ii) Why packing fraction may be positive or negative where as mass defect cannot.
- (iii) Calculate the average binding energy per nucleon in 3_1H (mass = 3.016050 u) and 3_2H (mass = 3.016030 u) $(1\frac{1}{2}+1\frac{1}{2}+2)$
- (b) (i) KHF_2 can easily be formed where as $KHCl_2$ does not—Explain.
- (ii) Predict the structures of NOCl and ICl_2^+
- (iii) Calculate the lattice energy of $Mg(ClO_4)_2$ using Kapustinskii equation. Radii of Mg^{2+} and

ClO_4^- ions are 86 pm and 226 pm respectively.

$$K = 1.214 \times 10^5 \text{ kJ unit.} \quad 1+2+2$$

- (c) (i) Draw the M.O. diagram of NO
 (ii) Why NO is more reactive than N_2 ?
 (iii) Explain the ligating behaviour of NO. $2+2+1$
- (d) (i) Although oxygen shows high second electron affinity value, MgO is well known. Explain.
 (ii) Suggest reasonable crystal structure of CaF_2 and TiO_2 from the following radii (pm) Ca^{2+} - 126, F^{-1} - 119, Ti^{4+} - 74.5, O^{2-} = 126.
 (iii) The melting point of AgCl is 445°C where as in case of KCl it is 776°C ; Although the radii of K^+ and Ag^+ are almost same. $1\frac{1}{2}+1\frac{1}{2}+2$
- (e) (i) 1 gm of ^{226}Ra emits 11.6×10^{17} α particles per year. Calculate the value of the Avogadro number. ($t_{1/2} = 1590$ year)
 (ii) With the help of MO theory calculate the bond order of NO.
 (iii) What do you mean by δ -bond ? $2+2+1$
- (f) (i) Explain why Be shows electrical conductivity.
 (ii) U-238 cannot be commonly used as nuclear fuel— Explain.
 (iii) What do you mean by nuclear isomerism ? $2+2+1$

3. Answer any one question :

1×10

(a) (i) Calculate electron gain enthalpy ($-EA$) of chlorine from the following ΔH data (KJ mol^{-1})— $\text{DCl}_2 = 242$, $I_{\text{Na}} = 494$, $\Delta H_{\text{Sub}}(\text{Na}) = 109$, $\Delta H_f^\circ(\text{NaCl}) = -414$, $r_{\text{Na}^+} + r_{\text{Cl}^-} = 281$ pm in NaCl.

(ii) Explain the bonding of $[\text{Re}_2\text{Cl}_8]^{2-}$ in the light of MO theory.

(iii) Among MgCO_3 and CaCO_3 —which is thermally more stable and why ?

(iv) What are the differences between ion-dipole interaction and induced dipole interaction ?

3+4+1+2

(b) (i) Define Frenkel and Schottky defects in solid. Cite examples for each defects.

(ii) What do you mean by receptor-guest interaction ?

(iii) What is artificial radioactivity ? Given an example.

(iv) Write down the hazards of radiation and how this can be prevented ?

3+2+2+3